

## T05D09 – 15.1 Std. Enthalpy Changes of Rxn Practice

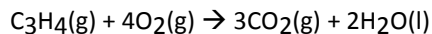
Name.....

1. Throughout this question, use relevant information from the Data Booklet.

(a) Define the term *standard enthalpy change of formation*, and illustrate your answer with an equation, including state symbols, for the formation of nitric acid.

(4)

(b) Propyne undergoes complete combustion as follows:



Calculate the enthalpy change of this reaction, given the following additional values:

$$\Delta H_f^\ominus \text{ of } \text{CO}_2(\text{g}) = -394 \text{ kJ mol}^{-1}$$

$$\Delta H_f^\ominus \text{ of } \text{H}_2\text{O}(\text{l}) = -286 \text{ kJ mol}^{-1}$$

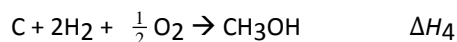
(4)

(c) ~~Predict and explain whether the value of  $\Delta S^\ominus$  for the reaction in part (b) would be negative, close to zero, or positive.~~

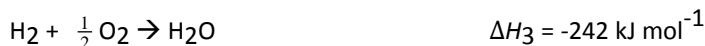
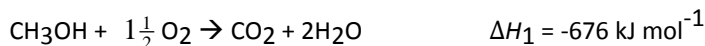
(3)

(Total 11 marks)

2. Calculate the enthalpy change,  $\Delta H_4$  for the reaction



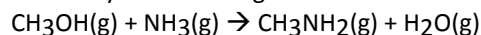
using Hess's Law, and the following information.



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(Total 4 marks)

3. Methylamine can be manufactured by the following reaction.



(a) Define the term *standard enthalpy change of formation*.

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(2)

- (b) The values of standard enthalpy changes of formation for some compounds are shown in the table.

Compound	$\Delta H_f^\ominus / \text{kJ mol}^{-1}$
$\text{NH}_3(\text{g})$	-46
$\text{H}_2\text{O}(\text{g})$	-242

Predict, with a reason, whether the value of  $\Delta H_f^\ominus$  for  $\text{H}_2\text{O}(\text{l})$  is less than, greater than, or equal to, the value of  $\Delta H_f^\ominus$  for  $\text{H}_2\text{O}(\text{g})$ .

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(2)

- (c) Use information from the table in (b) and from Table 11 of the Data Booklet to calculate the enthalpy change for the reaction used to manufacture methylamine.

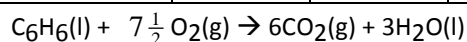
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(3)

(Total 7 marks)

4. Consider the following information.

Compound	$\text{C}_6\text{H}_6(\text{l})$	$\text{CO}_2(\text{g})$	$\text{H}_2\text{O}(\text{l})$
$\Delta H_f^\ominus / \text{kJ mol}^{-1}$	+49	+394	-286



Which expression gives the correct value of the standard enthalpy change of combustion for benzene (l), in  $\text{kJ mol}^{-1}$ ?

- A.  $12(-394) + (-286) - 2(49)$   
 B.  $12(394) + 6(286) - 2(-49)$   
 C.  $6(-394) + 3(-286) - (-49)$   
 D.  $6(394) + 3(286) - (-49)$

(Total 1 mark)